

## WHAT IS CLAIMED IS:

1. In a system comprising a network and at least one mobile station (MS) for enabling communications with the at least one MS, the system capable of performing a rescue procedure for rescuing a MS having a connection with the network that has become a potentially failing connection, a method for adjusting pilot signal strength add and drop thresholds  
 5 T\_ADD\_R and T\_DROP\_R used by the MS having the potentially failing connection in determining an updated active set of pilots for use by the MS in the rescue procedure, the method comprising:

incrementally lowering T\_ADD\_R and T\_DROP\_R by an amount  
 10 STEP\_dec\_thres at one or more specific time instants  $t_N$ ,  $N = 1, 2, \dots, M$  during the rescue procedure, each time instant separated by a time  $T_d$ .

2. The method as recited in claim 1, further including lowering T\_ADD\_R and T\_DROP\_R in accordance with pilot signal strengths ( $E_c/I_o$  values) measured at the MS.

3. The method as recited in claim 1, further including lowering T\_ADD\_R and T\_DROP\_R by not more than a total amount MAX\_dec\_thres during the rescue procedure.

4. The method as recited in claim 1, further including incrementally adjusting  $T_d$  between time instants  $T_N$ .

5. The method as recited in claim 2, further including increasing  $T_d$  between one or more time instants  $T_N$  if a combined pilot  $E_c/I_o$  for the updated active set of the MS is  
 20 higher than a predetermined desired combined pilot  $E_c/I_o$ .

6. The method as recited in claim 2, further including:

increasing  $T_d$  between one or more time instants  $T_N$  if a difference between a combined pilot  $E_c/I_o$  for the updated active set of the MS and the combined pilot  $E_c/I_o$  for a previous updated active set of the MS is larger than a predetermined threshold; and

5 decreasing  $T_d$  between one or more time instants  $T_N$  if the difference between the  $E$  for the updated active set of the MS and the  $E$  for a previous updated active set of the MS is smaller than the predetermined threshold.

7. The method as recited in claim 1, further including incrementally

adjusting STEP\_dec\_thres at one or more time instants  $T_N$ .

8. The method as recited in claim 7, further including adjusting

STEP\_dec\_thres at each time instant  $T_N$ , the step of adjusting STEP\_dec\_thres at each time instant  $T_N$  comprising:

determining a number of complete rescue cycles  $K$  that could be completed before a rescue procedure timer reaches its terminal count; and

10 computing  $(T\_ADD\_H - MAX\_dec\_thres)/(K-1)$  as a value for STEP\_dec\_thres at each time instant  $T_N$ , wherein  $T\_ADD\_H$  is an initial value for  $T\_ADD\_R$  at the start of the rescue procedure.

9. The method as recited in claim 7, further including increasing

STEP\_dec\_thres at each time instant  $T_N$ , the step of increasing STEP\_dec\_thres at each time instant  $T_N$  comprising:

20 determining a number of complete rescue cycles  $K$  that could be completed before a rescue procedure timer reaches its terminal count;

determining  $\delta = 2 * (MAX\_dec\_thres)/(K-1)K$ , where  $\delta$  is an initial value for STEP\_dec\_thres at the start of the rescue procedure; and

25 computing  $\delta * N$  as a value for STEP\_dec\_thres at each time instant  $T_N$ , wherein  $N = 1, 2, \dots, (K-1)$ .

10. The method as recited in claim 7, further including:

decreasing STEP\_dec\_thres at one or more time instants  $T_N$ ,  $N = 1, 2, \dots, M$ ,  
if a difference between a combined pilot  $E_c/I_o$  for the updated active set of the MS at a particular  
time instant  $T_N$  and the combined pilot  $E_c/I_o$  for a previous updated active set of the MS at an  
immediately previous time instant  $T_{N-1}$  is larger than a predetermined threshold; and

increasing STEP\_dec\_thres at one or more time instants  $T_N$ ,  $N = 1, 2, \dots, M$ ,  
if the difference between the combined pilot  $E_c/I_o$  for the updated active set of the MS at the  
particular time instant  $T_N$  and the combined pilot  $E_c/I_o$  for the previous updated active set of the  
MS at the immediately previous time instant  $T_{N-1}$  is smaller than or equal to a predetermined  
threshold.

11. The method as recited in claim 2, further including determining

MAX\_dec\_thres, the determination of MAX\_dec\_thres comprising:

selecting a desired combined pilot  $E_c/I_o$  that gives a high probability of  
producing a good link as  $(E_c/I_o)_{\text{desired}}$ ;

measuring or estimating an  $E_c/I_o$  value from a strongest pilot in the  
updated active set as  $(E_c/I_o)_{\text{max}}$ ; and

solving  $(E_c/I_o)_{\text{max}} + (N-1) (E_c/I_o)_{\text{min}} \geq (E_c/I_o)_{\text{desired}}$  for  $(E_c/I_o)_{\text{min}}$ , where  $N$   
is a maximum allowed active set size; and

computing MAX\_dec\_thres as  $T\_ADD\_R - (E_c/I_o)_{\text{min}}$ .

12. The method as recited in claim 2, further including:  
 measuring  $E_c/I_o$  for all pilots detectable by the MS having the potentially  
 failing connection;  
 placing the measured pilots in a list in order of decreasing  $E_c/I_o$ ; and  
 starting with the pilot in the list having the highest  $E_c/I_o$  and going  
 through the list in order of decreasing  $E_c/I_o$ ,  
 measuring the combined  $E_c/I_o$  for all pilots in the updated active  
 set,  
 for a current pilot from the list, determining the combined  $E_c/I_o$  for  
 all pilots in the updated active set plus the current pilot, and  
 adding the current pilot to the updated active set if the current pilot  
 increased the combined  $E_c/I_o$  measurement by a predetermined percentage.

13. The method as recited in claim 1, the method for additionally determining  
 an updated active set of pilots for use by the network in the rescue procedure, the method further  
 comprising:  
 transmitting a uniform energy signal from the MS having the potentially  
 failing connection; and  
 for each of one or more BSs in a neighborhood of the MS having the  
 potentially failing connection, measuring a strength of the uniform energy signal, and adding the  
 BS to the updated active set used by the network if the strength of the uniform energy signal for  
 that BS is above a predetermined threshold.

14. The method as recited in claim 13, wherein the uniform energy signal is a  
 reverse link pilot signal.

15. The method as recited in claim 13, wherein the uniform energy signal is a  
 data signal at a predetermined data rate with predetermined data.

16. The method as recited in claim 1, the method for additionally determining an updated active set of pilots for use by the network in the rescue procedure, the method further comprising:

for each of one or more BSs in a neighborhood of the MS having the potentially failing connection, adding the BS to the updated active set used by the network in accordance with a location of the MS and network planning information.

17. The method as recited in claim 1, the MS having the potentially failing connection capable of transmitting a uniform energy signal, the method for additionally determining an updated active set of pilots for use by the network in the rescue procedure, the method further comprising:

for each of one or more BSs in a neighborhood of the MS having the potentially failing connection, measuring a strength of the uniform energy signal, and adding the BS to the updated active set used by the network if the strength of the uniform energy signal for that BS is above a predetermined threshold.

18. The method as recited in claim 17, wherein the uniform energy signal is a reverse link pilot signal.

19. The method as recited in claim 17, wherein the uniform energy signal is a data signal at a predetermined data rate with predetermined data.

20. A mobile station (MS) for communicating with a network and for assisting in performing a rescue procedure when the MS has a connection with the network that has become a potentially failing connection, the MS comprising:

a processor programmed for incrementally lowering pilot signal strength add and drop thresholds  $T\_ADD\_R$  and  $T\_DROP\_R$  by an amount  $STEP\_dec\_thres$  at one or more specific time instants  $t_N$ ,  $N = 1, 2, \dots, M$  during the rescue procedure, each time instant separated by a time  $T_d$ ;

wherein  $T\_ADD\_R$  and  $T\_DROP\_R$  are used by the MS for determining an updated active set of pilots for use in the rescue procedure.

21. The MS as recited in claim 20, the processor further programmed for lowering  $T\_ADD\_R$  and  $T\_DROP\_R$  in accordance with pilot signal strengths ( $E_c/I_o$  values) measured at the MS.

22. The MS as recited in claim 20, the processor further programmed for lowering  $T\_ADD\_R$  and  $T\_DROP\_R$  by not more than an total amount  $MAX\_dec\_thres$  during the rescue procedure.

23. The MS as recited in claim 20, the processor further programmed for incrementally adjusting  $T_d$  between time instants  $T_N$ .

24. The MS as recited in claim 21, the processor further programmed for increasing  $T_d$  between one or more time instants  $T_N$  if a combined pilot  $E_c/I_o$  for the updated active set of the MS is higher than a predetermined desired combined pilot  $E_c/I_o$ .

25. The MS as recited in claim 21, the processor further programmed for:  
 increasing  $T_d$  between one or more time instants  $T_N$  if a difference between a combined pilot  $E_c/I_o$  for the updated active set of the MS and the combined pilot  $E_c/I_o$  for a previous updated active set of the MS is larger than a predetermined threshold; and  
 decreasing  $T_d$  between one or more time instants  $T_N$  if the difference between the  $E$  for the updated active set of the MS and the  $E$  for a previous updated active set of the MS is smaller than the predetermined threshold.

26. The MS as recited in claim 20, the processor further programmed for incrementally adjusting  $STEP\_dec\_thres$  at one or more time instants  $T_N$ .

27. The MS as recited in claim 26, the processor further programmed for adjusting STEP\_dec\_thres at each time instant  $T_N$  by:

determining a number of complete rescue cycles  $K$  that could be completed before a rescue procedure timer reaches its terminal count; and

5 computing  $(T\_ADD\_H - MAX\_dec\_thres)/(K-1)$  as a value for STEP\_dec\_thres at each time instant  $T_N$ , wherein  $T\_ADD\_H$  is an initial value for  $T\_ADD\_R$  at the start of the rescue procedure.

28. The MS as recited in claim 26, the processor further programmed for increasing STEP\_dec\_thres at each time instant  $T_N$  by:

10 determining a number of complete rescue cycles  $K$  that could be completed before a rescue procedure timer reaches its terminal count;

determining  $\delta = 2*(MAX\_dec\_thres)/(K-1)K$ , where  $\delta$  is an initial value for STEP\_dec\_thres at the start of the rescue procedure; and

15 computing  $\delta*N$  as a value for STEP\_dec\_thres at each time instant  $T_N$ , wherein  $N = 1, 2, \dots, (K-1)$ .

29. The MS as recited in claim 26, the processor further programmed for:

decreasing STEP\_dec\_thres at one or more time instants  $T_N$ ,  $N = 1, 2, \dots, M$ , if a difference between a combined pilot  $E_c/I_o$  for the updated active set of the MS at a particular time instant  $T_N$  and the combined pilot  $E_c/I_o$  for a previous updated active set of the MS at an immediately previous time instant  $T_{N-1}$  is larger than a predetermined threshold; and

20 increasing STEP\_dec\_thres at one or more time instants  $T_N$ ,  $N = 1, 2, \dots, M$ , if the difference between the combined pilot  $E_c/I_o$  for the updated active set of the MS at the particular time instant  $T_N$  and the combined pilot  $E_c/I_o$  for the previous updated active set of the MS at the immediately previous time instant  $T_{N-1}$  is smaller than or equal to a predetermined threshold.

30. The MS as recited in claim 21, the processor further programmed for determining MAX\_dec\_thres by:

- selecting a desired combined pilot  $E_c/I_o$  that gives a high probability of producing a good link as  $(E_c/I_o)_{desired}$ ;
- measuring or estimating an  $E_c/I_o$  value from a strongest pilot in the updated active set as  $(E_c/I_o)_{max}$ ; and
- solving  $(E_c/I_o)_{max} + (N-1) (E_c/I_o)_{min} \geq (E_c/I_o)_{desired}$  for  $(E_c/I_o)_{min}$ , where N is a maximum allowed active set size; and
- computing MAX\_dec\_thres as  $T\_ADD\_R - (E_c/I_o)_{min}$ .

31. The MS as recited in claim 21, the processor further programmed for:

- measuring  $E_c/I_o$  for all pilots detectable by the MS having the potentially failing connection;
- placing the measured pilots in a list in order of decreasing  $E_c/I_o$ ; and
- starting with the pilot in the list having the highest  $E_c/I_o$  and going through the list in order of decreasing  $E_c/I_o$ ,
- measuring the combined  $E_c/I_o$  for all pilots in the updated active set,
- for a current pilot from the list, determining the combined  $E_c/I_o$  for all pilots in the updated active set plus the current pilot, and
- adding the current pilot to the updated active set if the current pilot increased the combined  $E_c/I_o$  measurement by a predetermined percentage.



32. A communications system for determining an updated active set of pilots used in a rescue procedure for rescuing a mobile station (MS) having a connection with a network that has become a potentially failing connection, the system comprising:

a MS, the MS comprising a processor programmed for  
 5 incrementally lowering pilot signal strength add and drop  
 thresholds  $T\_ADD\_R$  and  $T\_DROP\_R$  by an amount  $STEP\_dec\_thres$  at one or more specific  
 time instants  $t_N$ ,  $N = 1, 2, \dots, M$  during the rescue procedure, each time instant separated by a time  
 $T_d$ , wherein  $T\_ADD\_R$  and  $T\_DROP\_R$  are used by the MS for determining the updated active  
 set of MS pilots for use in the rescue procedure, and  
 10 transmitting a uniform energy signal during a time when the MS is  
 having the potentially failing connection; and  
 a network communicatively coupled to the MS, the network including one  
 or more pilots in a neighborhood of the MS for communicating with the MS, each pilot including  
 a processor programmed for receiving and measuring a strength of the uniform energy signal and  
 adding the pilot to the updated active set used by the network in performing the rescue procedure  
 if the strength of the uniform energy signal is above a predetermined threshold.

33. The system as recited in claim 32, wherein the uniform energy signal  
 transmitted by the MS is a reverse link pilot signal.

34. The system as recited in claim 32, wherein the uniform energy signal  
 20 transmitted by the MS is a data signal at a predetermined data rate with predetermined data.

35. The system as recited in claim 32, the method for additionally determining  
 the updated active set of pilots for use by the network in the rescue procedure, the method further  
 comprising:

for each of one or more BSs in the neighborhood of the MS having the  
 25 potentially failing connection, adding the BS to the updated active set used by the network in  
 accordance with a location of the MS and network planning information.

36. A network for communicating with a mobile station (MS) and for assisting in performing a rescue procedure when the MS has a connection with the network that has become a potentially failing connection, the MS having the potentially failing connection capable of transmitting a uniform energy signal, the network comprising:

one or more BS sectors in a neighborhood of the MS for communicating with the MS, each BS sector including a processor programmed for receiving and measuring a strength of the uniform energy signal and adding the BS sector to an updated active set used by the network in performing the rescue procedure if the strength of the uniform energy signal is above a predetermined threshold.

37. The network as recited in claim 36, wherein the uniform energy signal is a reverse link pilot signal.

38. The network as recited in claim 36, wherein the uniform energy signal is a data signal at a predetermined data rate with predetermined data.

39. In a system comprising a network and at least one mobile station (MS) for enabling communications with the at least one MS, the system capable of performing a rescue procedure for rescuing a MS having a connection with the network that has become a potentially failing connection, a method for adjusting pilot signal strength add and drop thresholds  $T\_ADD\_R$  and  $T\_DROP\_R$  used by the MS having the potentially failing connection in determining an updated active set of pilots for use by the MS in the rescue procedure, the method comprising:

at one or more specific time instants  $t_N$ ,  $N = 1, 2, \dots, M$  during the rescue procedure, each time instant separated by a time  $T_d$ ,

computing temporary rescue add and drop threshold values by lowering present values for  $T\_ADD\_R$  and  $T\_DROP\_R$  by an amount  $STEP\_dec\_thres$ ; and

computing add and drop threshold algorithms specified in Sections 2.6.6.2.5.2 and 2.6.6.2.3 of the IS-2000-5 Standard, respectively, after replacing static add and drop threshold values in those algorithms with the temporary rescue add and drop threshold values, to generate new values for  $T\_ADD\_R$  and  $T\_DROP\_R$ , respectively.